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Note
Chromosomes of *Blastophaga psenes* (Hymenoptera: Agaonidae)

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Parasitic wasps are one of the largest and most taxonomically complicated groups of insects (Rasnitsyn 1980). They play a very important role in food chains as parasitoids of many insect pests of agriculture and forestry. In addition, certain species of 'parasitic' Hymenoptera are associated with plants, either as pests or pollinators (Quicke 1997). Chromosomes of about 420 species of parasitic wasps have been studied (Gokhman 2009). However, chromosomes of the medium-sized family Agaonidae that is associated with fruits of the plant genus *Ficus*, were never examined before. We have managed to study the karyotype of *Blastophaga psenes* (Linnaeus), the sole pollinator of the edible fig, *Ficus carica* Linnaeus. The description of the karyotype is given below.

Syconia of the cultivated form of *F. carica* that contained immature stages of *B. psenes*, were collected by V.N. Fursov at Nikitsky Botanical Garden, Ukrainian Academy of Agrarian Sciences (about 5 km E Yalta, the Crimea, South Ukraine) on 2–10 October 2008, preserved at 10–12°C for three to four months and then incubated for a few days at room temperature. Cerebral ganglia of prepupae were used for karyotyping according to the technique developed by Imai et al. (1988). Chromosomes of a single male and five females were studied. Micrographs of chromosomes were obtained using Zeiss Axioskop 40 FL optic microscope fitted with Zeiss AxioCam MRc digital camera. Chromosomes of five diploid metaphase plates were measured on digital micrographs using Zeiss AxioVision; all chromosomes were then arranged according to the classification provided by Levan et al. (1964). Voucher adult specimens of *B. psenes* are deposited in the Zoological Museum, Moscow State University, Moscow, Russia.

RESULTS AND DISCUSSION

The chromosomal study of female individuals of *B. psenes* has revealed a chromosome set of 2n = 12 (Fig. 1). An analogous study of the male individual has yielded very few metaphases with n = 6 (not shown here). The haploid karyotype of this species comprises five large metacentric chromosomes and a smaller subtelocentric one (Fig. 2, Table 1).

The families Agaonidae (at least those belonging to Agaoninae; Rasplus et al. 1998), Torymidae and Ormyridae are usually believed to form a common clade (Noyes 1990, see also Bouček 1988 and Gibson et al. 1999). The karyotype structure similar to that found in *B. psenes* (five large metacentrics and a smaller subtelocentric/acrocentric) is also characteristic of many Torymidae (including most species of the less advanced subfamily Toryminae) and one of the two studied species of the Ormyridae that belong to the genus *Ormyrus* (see Gokhman 2009 for review).

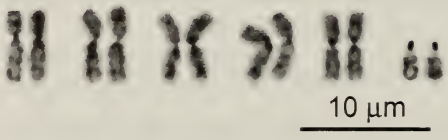

Fig. 1. Karyogram of the diploid karyotype of *Blastophaga psenes*.

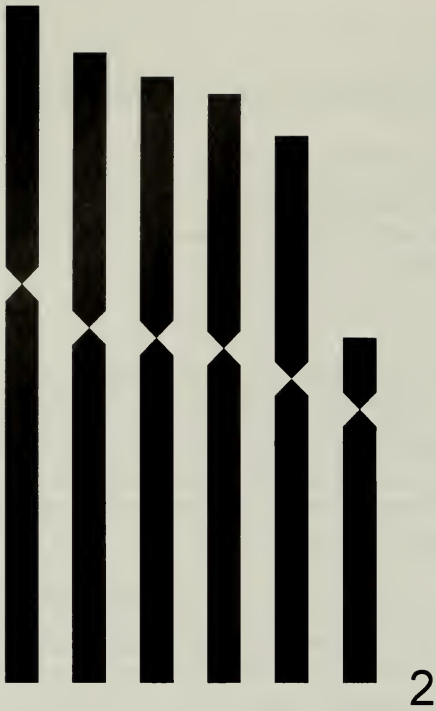

Fig. 2. Ideogram of the haploid karyotype of *Blastophaga psenes*.

Moreover, karyotypes of a few species of the Torymidae and Ormyridae that contain only five metacentric chromosomes are obviously derived from the preceding ones through tandem fusions, analogous, for example, to certain Eulophidae with similar chromosome sets (Gokhman 2009). The karyotype structure of *B. psenes* therefore represents the ground plan feature of the common clade of the Torymidae, Ormyridae and Agaonidae. On the other hand, karyotypes of many Pteromalidae (another group that is probably related to Agaonidae s.l.; Campbell et al. 2000) also comprise five biarmed chromosomes, and those chromosome sets could originate as well from a karyotype with an additional subtelocentric/acrocentric through chromosomal fusion (Gokhman 2009).

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Table 1. Parameters of chromosomes of *Blastophaga psenes*.

Chromosome no.	Relative length	Centromere index
1	19.97±0.84	41.04±2.86
2	18.58±0.37	43.73±2.69
3	17.87±0.32	43.17±3.96
4	17.34±0.38	43.20±3.96
5	16.08±0.66	44.39±4.00
6	10.16±0.72	22.48±3.27

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